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Inter- and intra-annual variations of transpiration at a rubber stand in lowland of central Cambodia

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In Southeast Asia, rubber plantation is rapidly expanding, and thus understanding the level of water consumption and tree physiology is a matter of importance to know the impacts on the local hydrology. Intra- and inter-annual variations in transpiration rate (E_t) at a rubber stand, growing in lowland of central Cambodia, were examined during two years based on sap flow measurements. As for seasonality, E_t was generally large in the rainy season and small in the dry season, showing sharp short-time drop in synchronization with the shedding in late January. Daily stand E_t was $\sim$ 2.0 mm day^{-1} in 2010 and $\sim$ 2.4 mm day^{-1} in 2011 at the maximum. An analysis of non-linear multiple regression for the canopy conductance (g_c) in the two years showed that the stomatal response of rubber trees was well explained by the changes in solar radiation, vapour pressure deficit, soil moisture availability, leaf area, and tree diameter. Sensitivity of g_c to the atmospheric drought indicates isohydric behavior of rubber trees, while the same analysis for each year showed possibility of change in leaf characteristics due to tree maturity and/or initiation of latex tapping. The best fit model also predicted relatively small sensitivity of g_c to the soil moisture deficit and rapid decrease in g_c under extreme drought conditions. Annual stand E_t estimated with the g_c obtained in the present analysis was 469 mm yr^{-1} in 2010, while it increased up to 658 mm yr^{-1} in 2011. To find out the most important environmental variables, we examined the effect of each variable by keeping the others unchanged. This hypothesis analysis showed that in the young rubber stand which were growing very rapidly, inter-annual change of stand E_t was determined mainly by the tree growth rate, not by the change of surrounding environments in the air and the soil.